Nearshore Berms R & D

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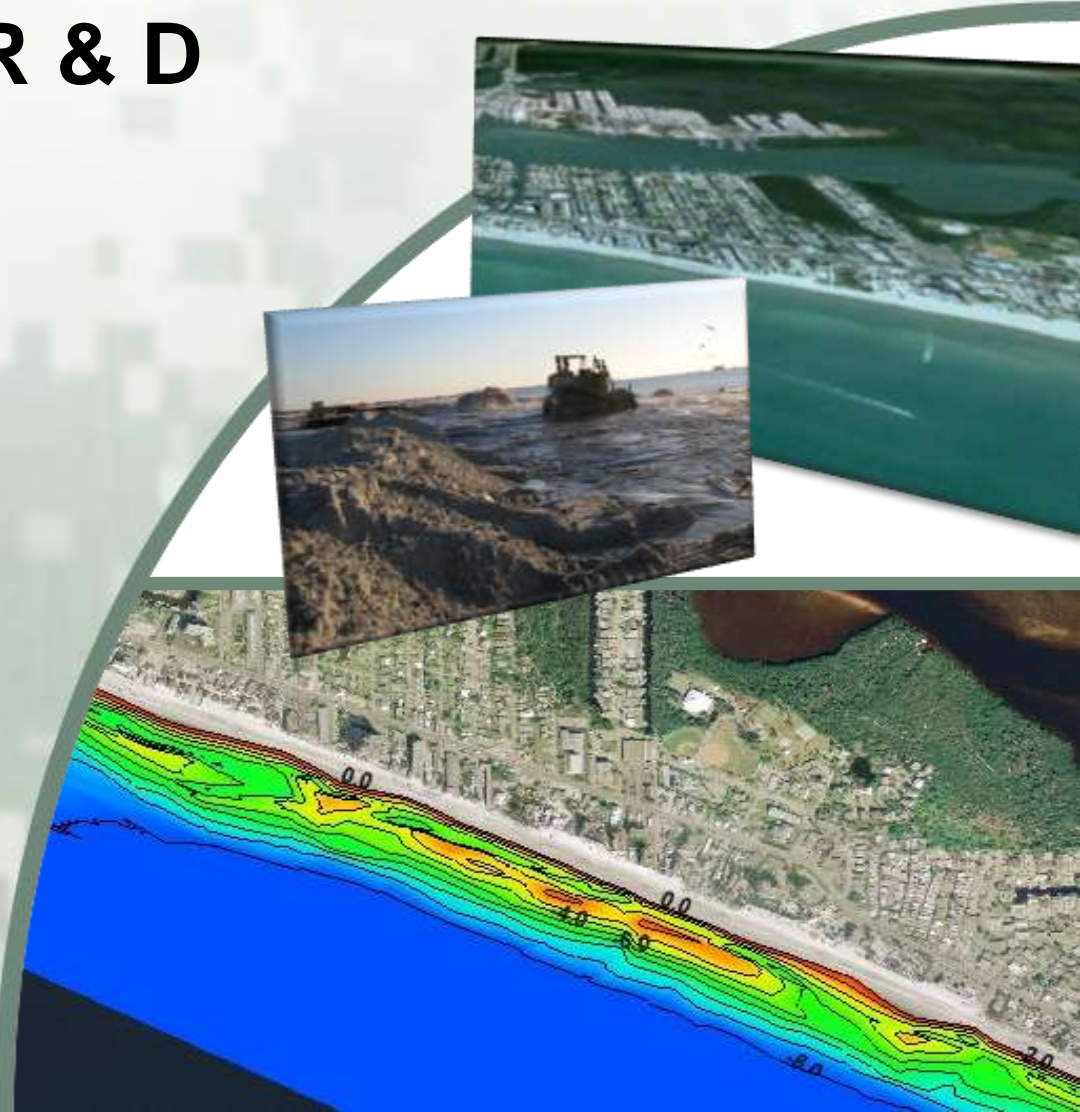
Jeff Lillycrop
Technical Director

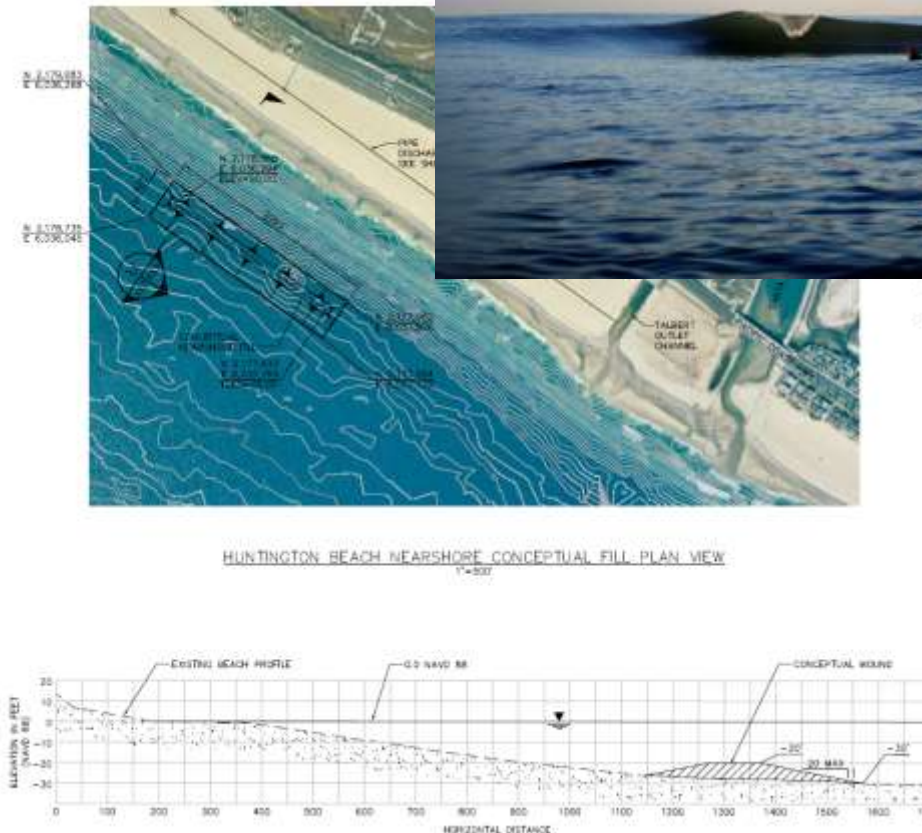**Eddie Wiggins**
Associate TD

US Army Corps
of Engineers®

Nearshore Berms in USACE

Small Dispersive
Placements

Shark River
Inlet (NAN)

Positive
Recreational
Feature

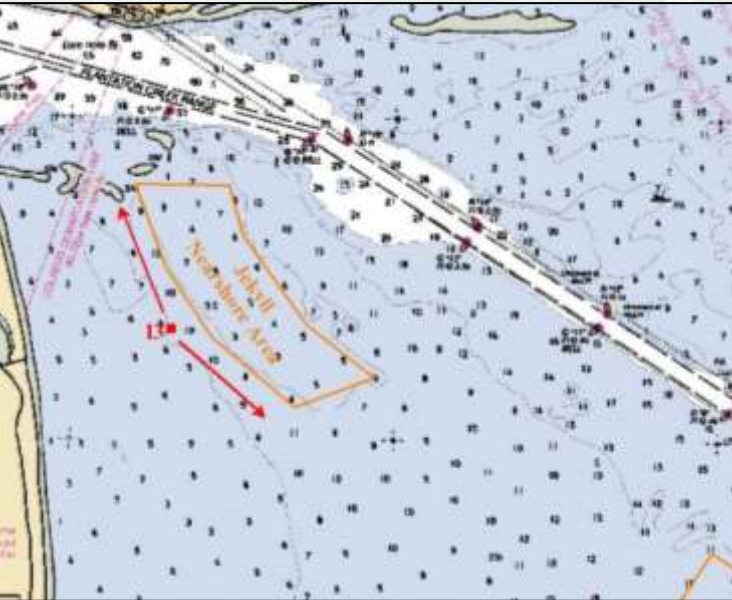HUNTINGTON BEACH NEARSHORE CONCEPTUAL FILL PLAN VIEW

Huntington Beach (SANDAG)

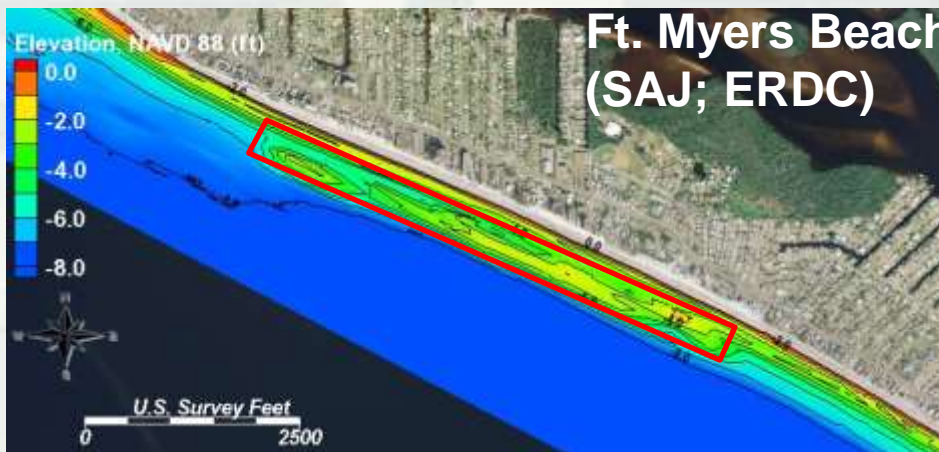Assateague Island, MD
(NAB)

ERDC

Nearshore Berms in USACE
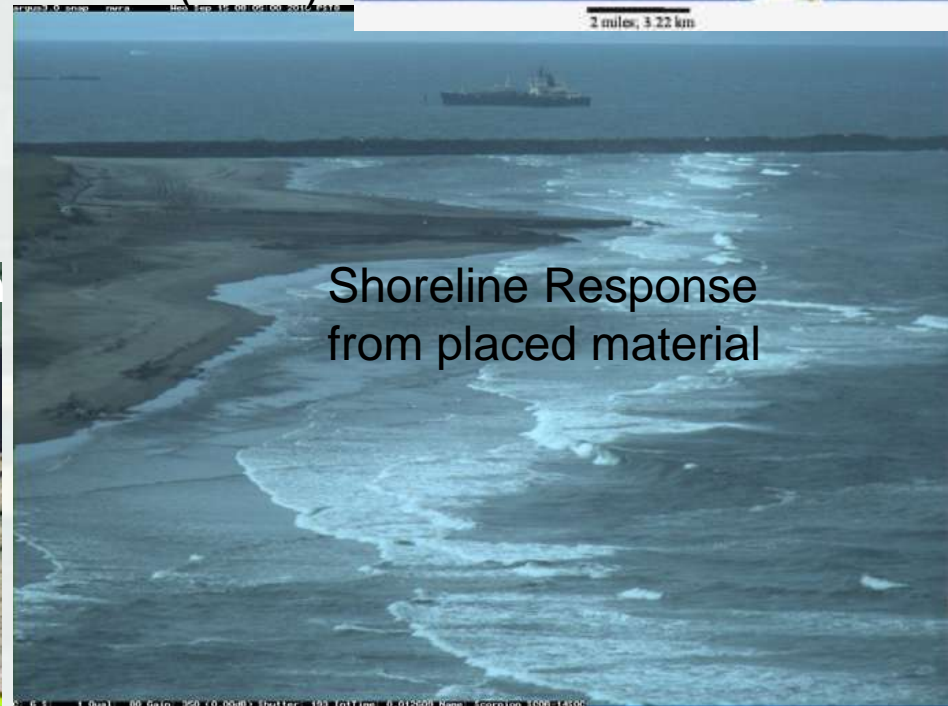
Brunswick (SAS; DOER)

Benson Beach Beneficial Use Placement (NWP)

Ft. Myers Beach (SAJ; ERDC)

Shoreline Response from placed material

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What Are Nearshore Berms?

Active Littoral Nearshore Placements (designed to migrate/disperse)

Alternative for placement for O&M sediment in nearshore

Ideally sited downdrift of navigation project, or erosional areas

Example: In Florida, sand with >10% fines cannot be placed on beach

Goals:

- Reduce O&M cost
- Nourish downdrift beach
- Selectively transport fines offshore and sand onshore
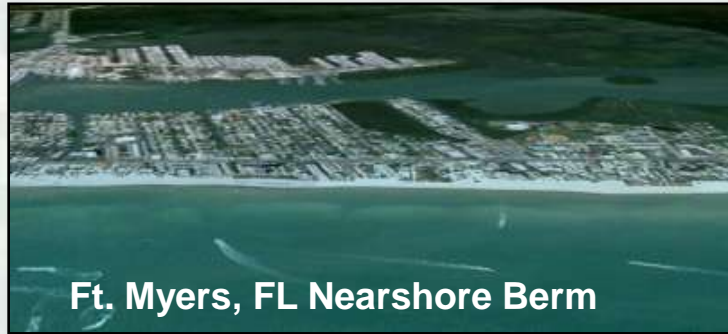
Downdrift of Ft. Myers Inlet, FL
POC: Jim Lagrone, SAJ
Photo Courtesy Dr. Ping Wang, USF

Objective of R&D Work Unit in RSM

Ft. Myers, FL Nearshore Berm

Statements of Need

Design and Evaluation Tool for Nearshore Berm Placement of Non-Beach Compatible Material
Tracking Number 2011-N-15

Nearshore Placement of Dredged Sediment Assessment
Tracking Number 2011-N-19

❑ **Advancing the research on nearshore berms through extensive monitoring efforts and basic research to provide answers to fundamental questions regarding the physical, environmental, and economical impact of the U.S. Army Corps' nearshore berm projects.**

Products:
- **Leveraged Field Studies & Reports with Districts & CIRP**
- **Numerical Morphology Modeling (2D Enhanced CMS)**
- **Planning Calculator Tool (Web-app)**
- **Guidance Documents**

Placement of O&M Sediments

Challenges for O&M Placement and RSM

Mixed sediment

- *Fines (silts, mixed sands) often unsuitable for onshore placement*

Reduced CDF Capacity

- *Offshore disposal and Confined Disposal Facilities (CDFs) remove sediment from regional littoral system*
  - *Lifetimes are finite*
  - *CDFs are 4x cost of nearshore placement*
  - *Great Lakes CDFs at 80% capacity*

Navigation Structures Needs

- *Jetty degradation*
  - *Beaches down drift of navigation channels eroding*
  - *Concern about flanking of jetties and breaching*

Hopper Dredge

Hopper

Pump-out Station

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Questions

Placement Method
- *How does placement method (pumped vs. hopper) affect evolution?*

Quantity and Rigor of Design
- *Should the placement be a small quantity 'dumped' or a large quantity designed berm?*

Cross-shore Location
- *What are the most successful cross-shore and alongshore designs that will promote onshore migration and/or retention of the sediment?*
- *How do large, shallow nearshore berms behave as short-term shore protection through wave dissipation, and what are the social implications?*

Alongshore Location
- *Where should dredged sediment be placed with regards to nodal zones of longshore sediment transport to minimize rehandling (infilling navigation channel) and cost?*

Environmental Concerns
- *How will the distribution of various types of sediment disperse and be transported with regards to fine sediments and Submerged Aquatic Vegetation (SAV; seagrasses) or other ecological habitat (reefs)?*
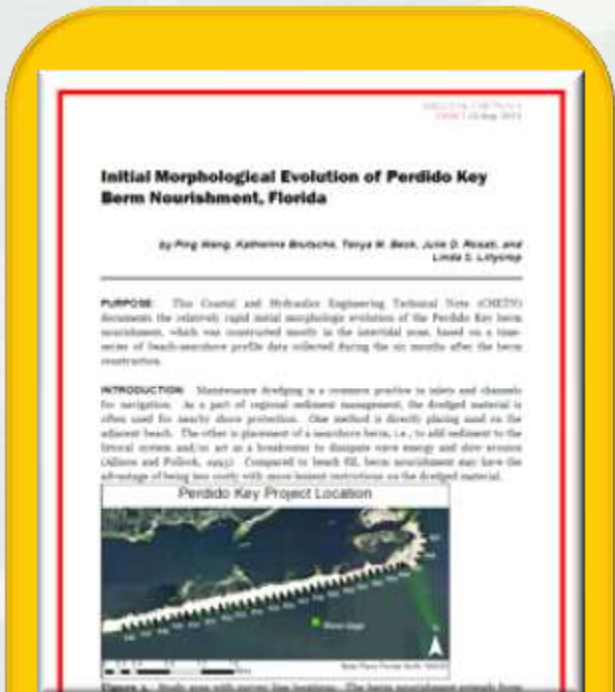
Swash Zone

Between Bar and shore
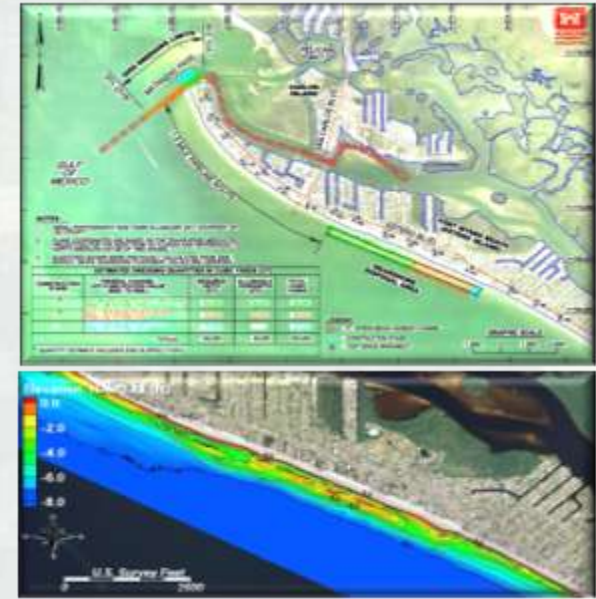
Bar

Over Bar

Offshore of Bar
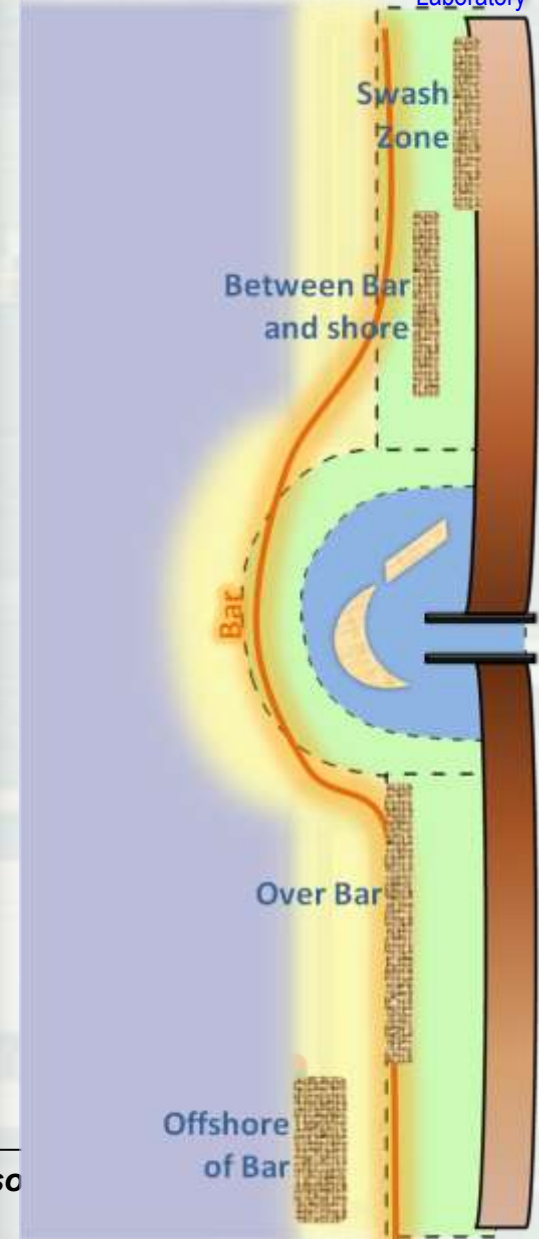
FY12 Accomplishments

Tech Report: 2-YR Monitoring Ft. Myers Nearshore Berm, FL

CHETN/RSM-TN: Perdido Key Nearshore Berm, FL

Ft. Myers Nearshore Berm

Perdido Key Nearshore Berm
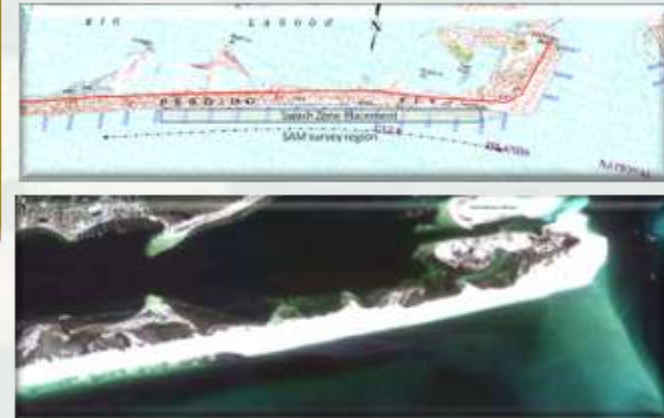
Innovative solutions for a safer, better world
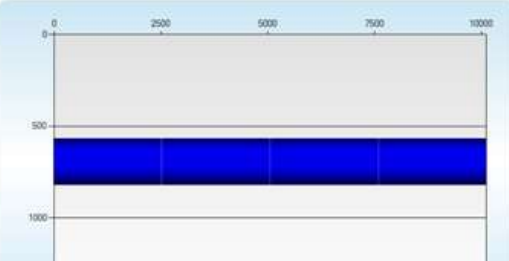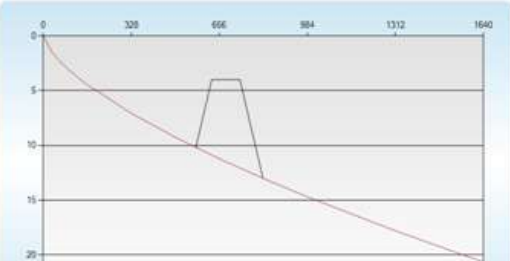
FY12 Accomplishments

Desktop Planning Tool: *Nearshore Berm Calculator*

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FY12 Accomplishments

Historical Berms In CIRP ArcGIS Portal (CE-Dredge; NCMP)

CIRP Portal – ArcGIS Online – NCDB & CE-Dredge

Monitoring Projects & Collaboration

- BERM VOLUME (CY): 148,000
- BERM RELIEF (FT): 7
- BERM WIDTH (FT): 600
- BERM LENGTH (FT): 1200
- WIS STATION/NOAA BUOY #:
- SEDIMENT SIZE D50 (MM): 0.25
- % FINES OF FILL: 6
- L RANGE (FT):
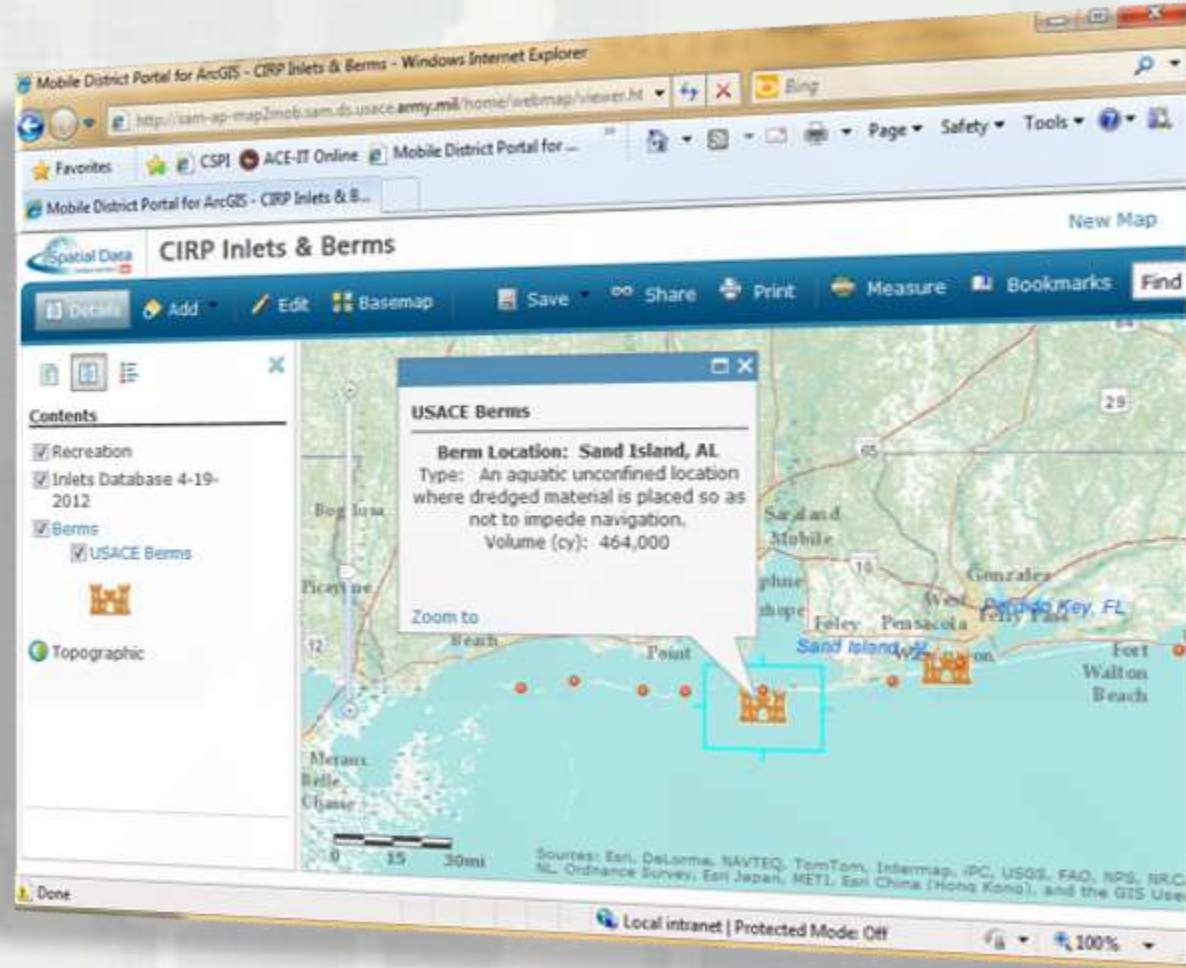- ROX. WATER DEPTH (FT): 15 TO 28
- CEMENT DATE: DECEMBER 1988 TO JANUARY 1989
- ITORING: YES

IATED RESEARCH ARTICLES

○ Perdido Key: Monitored since Jan 2012
○ Egmont: Starting Sep 2012
○ New Smyrna Beach: Started Aug 2012
○ Ft. Myers Beach: Monitored since May 2010
(Complete; Starting Oct 2012)

Egmont 2012

New Smyrna 2012

Field Research Facility

Perdido Key, FL 2012

Ft. Myers 2009/12

MAP DATA ©2012 GOOGLE, INEGI, TELE ATLAS IMAGERY ©2012 NASA, TERRAMETRICS · TERMS OF US

Future direction

o Detailed monitoring and analysis of each nearshore berm placement

- o beach and nearshore morphology change
- o surface and subsurface sedimentology
- o nearshore wave climate and hydrodynamics

o Define and parameterize the controlling factors on nearshore berm migration based on present studies

o Develop the Nearshore Berm calculator from a simple planning to a more comprehensive model that uses empirical formulas to predict a design's potential performance

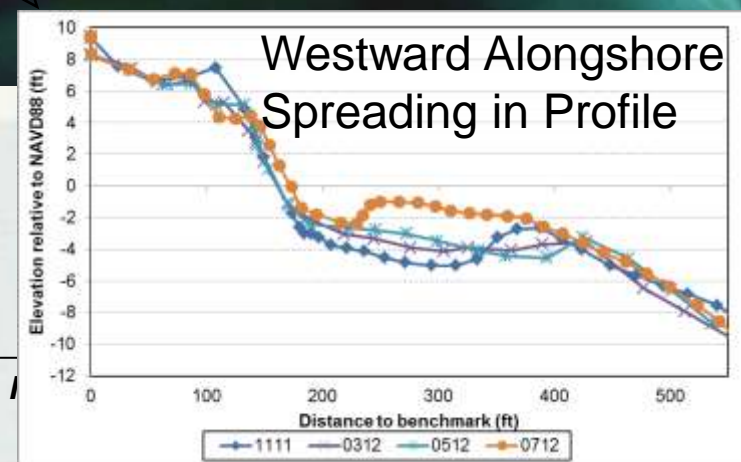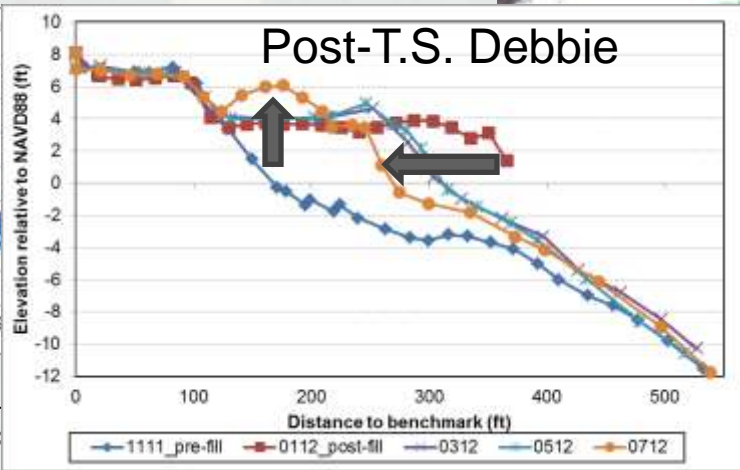o Evaluate detailed and high-density hydrodynamic, wave, and bathymetric data with a numerical model that can simulate quasi-3D cross-shore processes within the surfzone
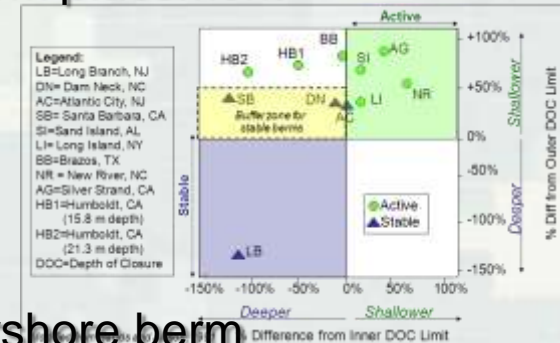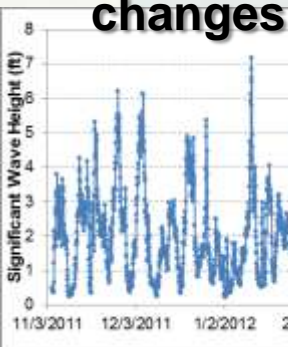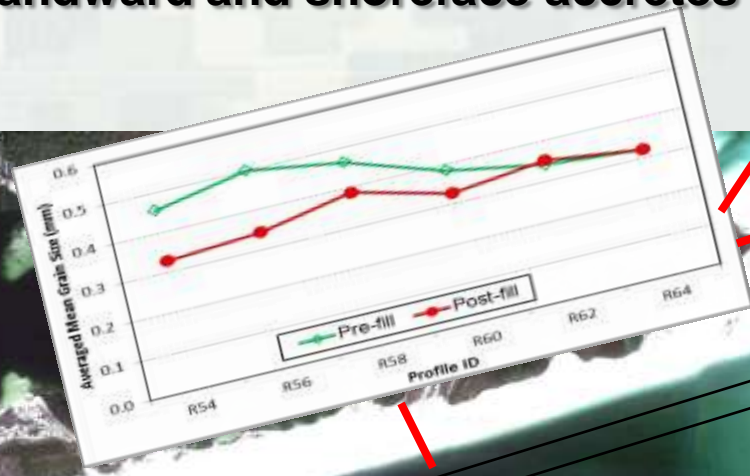
Perdido Key Swash Zone Berm (Jan 2012)

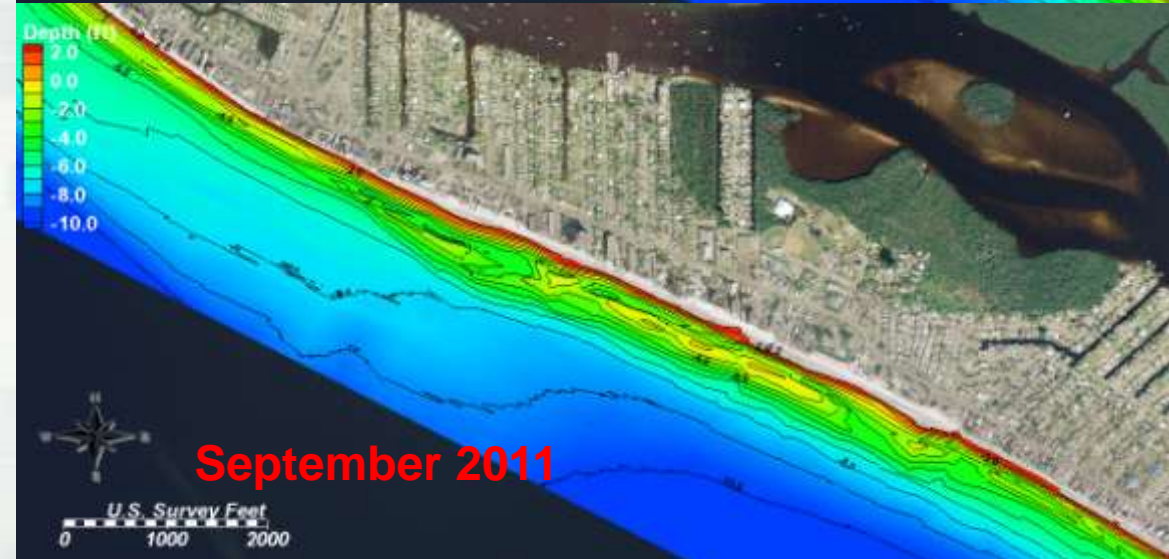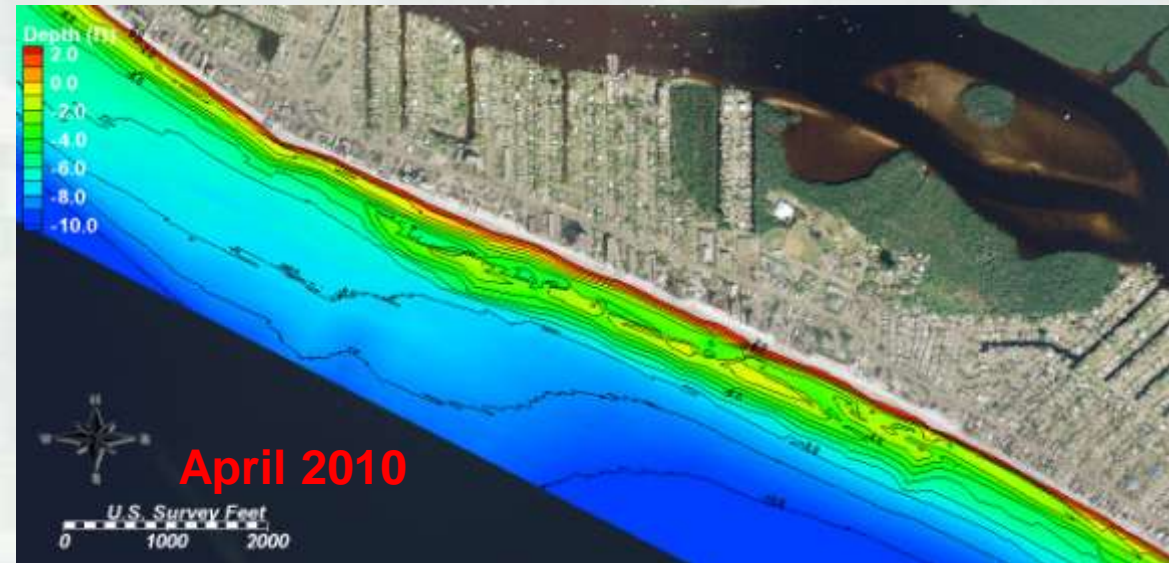- Sediment grades coarser away from inlet; fill is uniform inlet material
- Following placement, shoreline erodes landward and shoreface accretes
- Rapid Erosion furthest from the inlet; lowest erosion rates near the ebb shoal bypass bar
- Alongshore spreading through the nearshore profile
- Inlet shoreline changes not substantial; limited bayside changes

Post-T.S. Debbie

Westward Alongshore Spreading in Profile

Ft. Myers Nearshore Berm (Jun 2009; Fall 2012)

April 2010

U.S. Survey Feet
0   1000   2000

September 2011

U.S. Survey Feet
0   1000   2000

o **Fine sediment found in trough and offshore for 1st year; 2nd year none in trough, and coarsening of berm/trough to native grain size as migrating**

o **Berm migrated 150 ft/yr; characteristic of an asymmetric onshore migrating bar**

o **Gaps in berm migrated alongshore, but there was little alongshore spreading**

o **Negligable effects to the shoreline response (low-wave energy)**

o **Overall, positive performance of nearshore berm**

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New Smyrna Nearshore Berm (Aug 2012)

ONR Inlets DRI/RIVETS
New River Inlet, NC

CESAJ

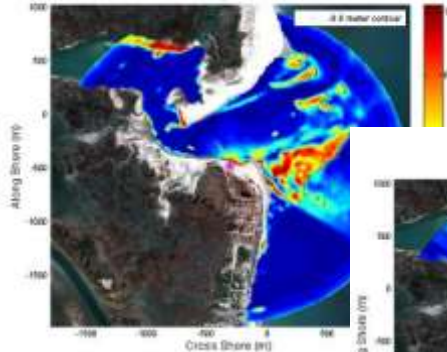US ARMY CORPS OF ENGINEERS: ENGINEER RESEARCH & DEVELOPMENT CENTER
Field Research Facility

RADAR INLET OBSERVING SYSTEM:
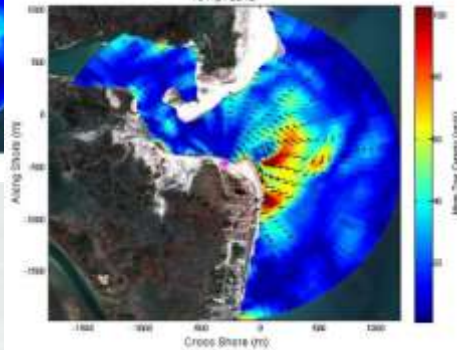**Remotely acquired waves, currents, and bathymetry**

Mean Intensity
15-Apr-2012

Mean True Currents
15-Apr-2012

http://www.offshoreswell.com

RIOS

PONCE de LEON INLET

NEARSHORE DISPOSAL AREA (1 MILE)

ATLANTIC OCEAN

ROCKHOUSE CREEK

INTRACOASTAL WATERWAY

NEW SMYRNA BEACH

| WGC PLATES NOT FOR CONSTRUCTION				VOLUSIA COUNTY, FL	PLATE:
				MAINTENANCE DREDGING PONCE DE LEON INLET	31
DEPARTMENT OF THE ARMY				NEARSHORE PLACEMENT AREA	

FY12 Knowledge Gained

o **Traditional monitoring techniques work for low-wave energy coasts**

    o **Highly detailed results for Gulf Coast environment**

    o **Actually quantify volume change because measurements "catch" the morphologic timescales**

o **Moderate to high wave energy coasts (Atlantic) need a more rigorous monitoring technique**

    o **Most berms/placements are highly dispersive; historically small in volume**

    o **RIOS being tested for remotely acquired waves, currents, and bathymetry**

    o **Example from Benson Beach, MCR**

   o **More research and improved technology is needed here**

FY13 Plans

Ft. Myers, FL Nearshore Berm
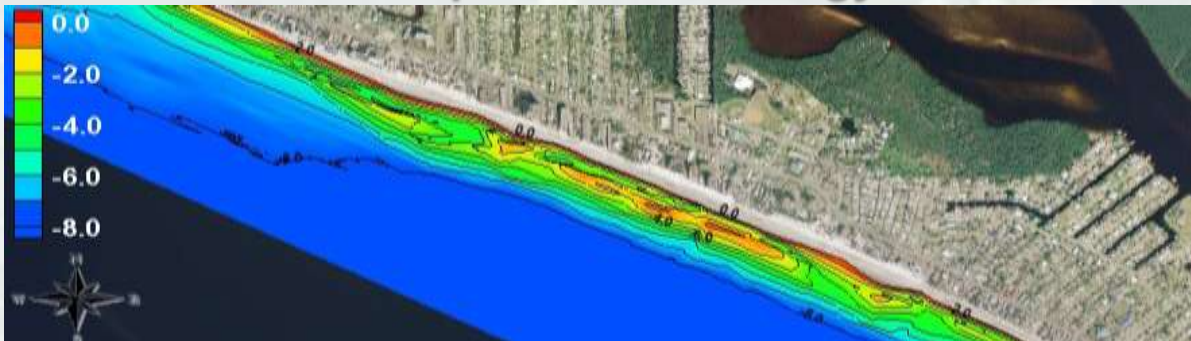
R&D Underway:

- **4 Monitoring Projects**
    - **Ft. Myers Beach (completed; new)**
    - **Perdido Key (ongoing)**
    - **Egmont Key (new)**
    - **New Smyrna (new)**
- **Compilation & assessment of literature and data**
- **Developing flexible tools (rapid desk-top to detailed models) for design**
- **Numerical Modeling of Berms Using CMS (Legault)**
- **Guidance documents and tools to District offices**
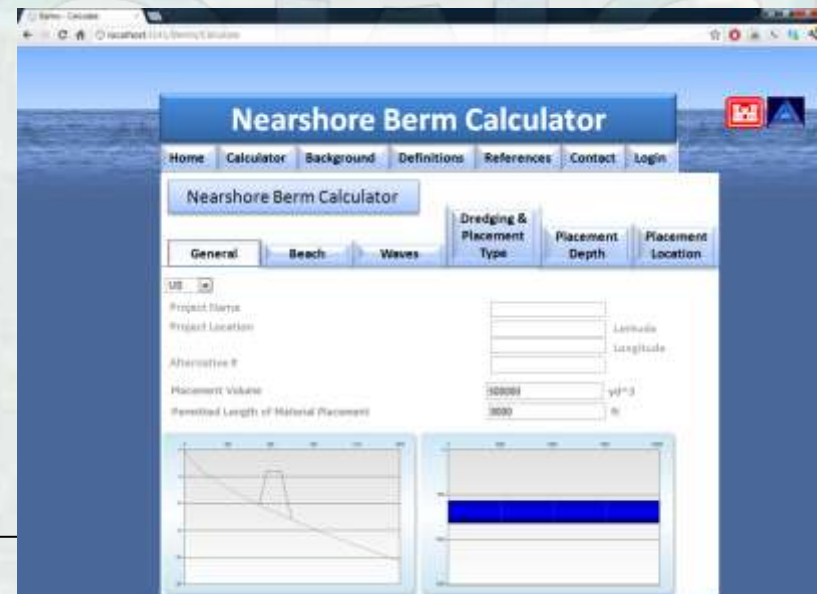
FY13 Plans

Nearshore Berm *Webinars & Workshop*

o **Initiate a Nearshore Placement Community within USACE**
  - o **Webinars on projects, issue topics, etc.**
  - o **Charette-like Workshop (for R&D and collaboration)**
  - o **Shared documents from R&D and the Field**
  - o **Goals are to:**
    - o **Demonstrate R&D of nearshore berm tools and methodologies**
    - o **Illustrate the variety of nearshore placement methods and projects from around the US**
    - o **Venue to discuss the tools available, permitting issues, and needs from the District community**
    - o **Discussion on long-term viability of this method**

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Big Picture Goals of this R&D Effort

What are we going to get out of our monitoring efforts?

Characterized Environments for Prediction

Input for Empirical Models

Numerical Modeling Datasets

What are these tools & products going to do for me?

Mobile Tools

Documentation of Projects

Numerical Modeling Methodology

Should I get involved in Nearshore Berms in RSM

YES!

Please let us know if you have data on berm performance*
or are planning a nearshore berm in the future.

* Expect a data call!

Thank You!

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